

## **Hybrid Si/SiC Power Modules Boost Power Density For Solar Power Generation And Energy Storage**

[Onsemi's](#) newest generation silicon and silicon carbide hybrid power integrated modules (PIMs) in F5BP packages are well suited to boost the power output of utility-scale solar string inverters or energy storage systems (ESSs). Compared to previous generations, the modules offer increased power density and higher efficiencies within the same footprint to increase the total system power of a solar inverter from 300 kW up to 350 kW.

This means a 1-GW capacity utility-scale solar farm using the latest-generation modules can achieve an energy savings of nearly 2 MW per hour or the equivalent of powering more than 700 homes per year. Additionally, fewer modules are required to achieve the same power threshold as the previous generation, which can reduce power device component costs by more than 25%, according to the vendor.

The F5BP-PIMs are integrated with 1050-V FS7 IGBTs and 1200-V D3 EliteSiC diodes to form a foundation that facilitates high voltage and high current power conversion while reducing power dissipation and increasing reliability. The FS7 IGBTs offer low turn-off losses and reduce switching losses by up to 8%, while the EliteSiC diodes provide superior switching performance and lower voltage flicker (VF) by 15% compared to previous generations, says the vendor.

These PIMs employ an innovative I-type neutral point clamp (INPC) for the inverter module and a flying capacitor topology for the boost module. The modules also use an optimized electrical layout and advanced direct bonded copper (DBC) substrates to reduce stray inductance and thermal resistance. In addition, a copper baseplate further decreases thermal resistance to the heat sink by 9.3%, ensuring the module remains cool under high operational loads. This thermal management is crucial in maintaining the efficiency and longevity of the modules, making them highly effective for demanding applications that require reliable and sustained power delivery.

With solar power having achieved the lowest levelized cost of energy (LCOE), it is increasingly becoming the go-to source for renewable power generation around the world. To compensate for solar power's variability, utility operators are also adding large-scale battery energy storage systems (BESSs) to ensure a stable energy flow to the grid. To support this combination of systems, manufacturers and utilities require solutions that offer maximum efficiency and reliable power conversion. Every 0.1% of efficiency improvement can equate to a quarter of a million dollars in annual operational savings for every one gigawatt of installed capacity, says onsemi.

"As a variable energy source dependant on sunlight, continual advances in increasing system efficiencies, reliability and advanced storage solutions are needed to be able to maintain the stability and reliability of global grids during peak and off-peak power demand," said Sravan Vanaparthi, vice president, Industrial Power Division, Power Solutions Group, onsemi. "A more efficient infrastructure increases adoption and assures us that, as more solar power generation is built out, less energy is wasted and pushes us forward on a path away from fossil fuels."

For more information, see the EliteSiC product [page](#).